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ABSTRACT

The first interim report on the Eisenhower State Curriculum Frameworks Projects examines the progress grantee states have made in completing mathematics and science curriculum frameworks and developing new approaches to teacher education, certification, recertification, and professional development. In addition, the report describes many of the issues confronting states as the projects move toward completion. The projects have made good progress on the development of curriculum frameworks, completing 22 of the 28 frameworks proposed across 16 states. The projects have established similar vision statements that call for all students to meet high standards in mathematics and science and are developing curriculum frameworks designed to serve as a bridge between national standards and local educators. Having devoted most of their time and resources to the development of curriculum frameworks, the vast majority of projects have not made much progress on the development of model guidelines for teacher education and certification, criteria for teacher rectification, and model professional development programs. Even among those projects that have made progress on the other products, they do not share a clear consensus of definition, purpose, and audience. A preliminary report finding is that aligning education policies, especially assessment systems, with curriculum frameworks is likely to be a slow process. (Author/MKR)

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Evaluation of the Dwight D. Eisenhower Mathematics and Science State Curriculum Frameworks Projects: First Interim Report

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Evaluation of the Dwight D. Eisenhower Mathematics and Science State Curriculum Frameworks Projects: First Interim Report

1996

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EXECUTIVE SUMMARY

The first interim report on the Eisenhower State Curriculum Frameworks Projects examines the progress grantee states have made in completing curriculum frameworks and developing new approaches to teacher education, certification, recertification, and professional development. In addition, the report describes many of the issues confronting states as the projects move toward completion. Subsequent reports will examine the quality of the curriculum frameworks and the other products and the impact of the projects on mathematics and science education.

The first cohort of these projects began in 1992, with the U.S. Department of Education's award of 3-year grants to the District of Columbia, Florida, Nebraska, New Jersey, New York, and Rhode Island. These grants average about $850,000 and run through September 30, 1995. In 1993, 10 more awards were made to Alaska, Arizona, Arkansas, Delaware, Louisiana, Maine, Massachusetts, Michigan, Oregon, and Wisconsin. These grants run through September 30, 1996.

The State Curriculum Frameworks Projects have made good progress on the development of curriculum frameworks. In fact, drafts have been completed on 22 of the 28 frameworks proposed across the 16 states. The projects have established similar vision statements that call for all students to meet high standards in mathematics and science. In addition, the project states are developing curriculum frameworks designed to serve as a bridge between the national standards and local educators.

Having devoted most of their time and resources to the development of curriculum frameworks, the vast majority of projects have not made much progress on the development of model guidelines for teacher education and certification, criteria for teacher recertification, and model professional development programs. Even among those projects that have made progress on the other products, they do not share a clear consensus of definition, purpose, and audience.

The unevenness with which the states have addressed the development of other products reflects in part the almost universal perception of model guidelines and the like as secondary to framework development. Although the majority of the projects still have more time to devote to the development of the other products and purposely concentrated on frameworks development first, it seems unlikely that the model guidelines for teacher

education and certification, criteria for teacher recertification, and model professional development programs will play a role of equal importance to the curriculum frameworks.

During the development of the curriculum frameworks, most project states confronted a variety of challenges. For example, developers of the curriculum frameworks needed to address differences between the frameworks and preexisting curricular guidance. Recognizing that the new frameworks could be easily dismissed by skeptical teachers, project leaders either attempted to demonstrate connections with or distance the new frameworks from old curricular guidance.

Other issues, such as the role of technology and the desirability of an interdisciplinary approach, often surfaced during the development of the curriculum frameworks. For example, the debate over the role of technology continues, with some states defining technology as a discipline and other states simply seeing it as a tool to use in mathematics and science. Similarly, some states developed integrated mathematics, science, and technology frameworks, while others maintained traditional disciplinary lines.

Along with those issues, the quality of the curriculum frameworks remains an open question. Although the study's experts have not yet conducted an assessment of the final frameworks documents from the project states, their assessment of 23 frameworks documents (including drafts from six project states) concluded that:

- Frameworks show marked progress in expanding beyond a basic-skills emphasis to instructional emphasis on higher-order skills for all students in mathematics and science.
- Frameworks differ in the degree to which standards statements and language are consistent with the expectations that national standards are establishing for students.
- Below the major headings and categories for content, the frameworks varied in how consistently the specific content topics or subheadings followed their own vision statements and national standards.

During the 1995-96 school year, the study's experts will assess the quality of a set of the final drafts of curriculum frameworks produced by the projects.

The State Curriculum Frameworks Projects have also had to deal with shifting state political environments and complex reform landscapes. To maintain their visibility and influence, the projects have established important linkages with other reform initiatives. In

some states, the projects have served as a vehicle for unprecedented coordination between a variety of mathematics and science reform efforts. In the 10 project states with National Science Foundation Statewide Systemic Initiatives (SSI), the frameworks projects' directors work closely with the SSIs' directors. In a few project states, the Regional Consortia were important contributors to framework development. However, they appeared to play more significant roles in some states without State Curriculum Framework Project grants.

Although most project states have not completed final drafts of the frameworks and other products, our preliminary finding is that aligning education policies—especially assessment systems—with curriculum frameworks is likely to be a slow process. The even more ambitious goal of changing teachers' practice and improving their skills requires significant changes in all aspects of the education system. However, to the extent they are successful, the State Curriculum Frameworks Projects are an attempt to change key components of that system. Although implementation of the projects' products is not a simple linear process, the projects are attempting to devise strategies that work to affect some of the many avenues of influence that ultimately determine what teachers choose to do in the classroom.

Both the second interim report due on October 1, 1996, and the final report due on October 1, 1997, will continue to explore the organization and development of the State Curriculum Frameworks Projects. More importantly, those reports will also analyze the quality of the projects' products and determine the impact of the projects on mathematics and science education.

I INTRODUCTION

In this document, we report our initial findings from the national evaluation of the Eisenhower State Curriculum Frameworks Projects. We focus on the progress grantee states have made in completing curriculum frameworks and developing new approaches to teacher education, certification, recertification, and professional development. In addition, we describe the issues states confront as the projects move toward completion. Thus, in this first report we answer the questions: "Are the projects doing what they said they would do?" "What are the challenges facing the states as they first develop and then begin to implement the projects' products?"

This evaluation has been carried out as part of a larger study in which we are also examining the Regional Consortiums Program, which, like the framework grants, is part of the U.S. Department of Education's Eisenhower National Program for Mathematics and Science Education. This larger study will result in a series of reports that will answer a set of increasingly important questions, culminating with the question: "What was the impact of the State Curriculum Frameworks Projects and the Regional Consortiums Program on mathematics and science education?" During the course of the evaluation of the State Curriculum Frameworks Projects, future reports will examine the quality of the projects' products and the specific contributions that the federal dollars made to state reform efforts.

The first cohort of the State Curriculum Framework Projects began in 1992, with the U.S. Department of Education's award of 3-year grants to the District of Columbia, Florida, Nebraska, New Jersey, New York, and Rhode Island for the development of curriculum frameworks in mathematics or science for grades K-12. Frameworks were seen as a method of constructing a bridge between the national standards and the classroom by "providing guidelines for the content of the curriculum and how that content should be organized and presented" (*Federal Register*, *57*(146), July 29, 1992, p. 33602). Given state-developed frameworks, local educators were "to implement, or to adapt, [them] for themselves" (*Federal Register*, *57*(146), July 29, 1992, p. 33603). In addition to developing framework documents, the solicitation called on grantees to:

- develop model guidelines for effective approaches to teacher education and certification based on world-class standards and the state curriculum framework tied to those standards;

- develop criteria for teacher recertification, and design and pilot test a model, cost-effective inservice professional development program for teachers based on world-class standards and the state curriculum frameworks tied to those standards (*Federal Register*, *57*(146), July 29, 1992, pp. 33603-33604).

The first set of grants average about $850,000 and run through September 30, 1995. In 1993, 10 more awards were made to Alaska, Arizona, Arkansas, Delaware, Louisiana, Maine, Massachusetts, Michigan, Oregon, and Wisconsin. These grants run through September 30, 1996.

In this introductory section, we begin by placing the framework projects in the context of the theory of systemic reform. We then describe the purpose of the interim report, list our key research questions and our timeline for addressing those questions, and describe the methods of the study. Finally, we outline the remainder of the document.

The State Curriculum Frameworks Projects in the Context of Systemic Reform

The State Curriculum Frameworks Projects are an early example of the federal strategy to promote systemic, standards-based reform throughout the nation. The original solicitation makes this point quite clearly: "The Secretary takes this action to focus Federal financial assistance on State curriculum frameworks as the starting point for systemic improvement in mathematics and science education" (*Federal Register*, 57(146), July 29, 1992, p. 33602).

As Figure 1 portrays, systemic reform refers to a model for improving schools that begins with the establishment of high standards for what all students should know and be able to do, the translation of these standards into concrete guidance for educators (i.e., curriculum frameworks), and the alignment of the full range of policies and practices (e.g., assessment, preservice education) to ensure that all students meet those standards (Smith and O'Day, 1991). According to the theory, the alignment of education policies and practices is accompanied by educators at all levels of the system with new skills and knowledge, and an infrastructure that guarantees continuous and evolving professional development. An additional component of systemic reform is a changed system of rewards, sanctions, and authority relations. Thus, the intention is to delineate clear and ambitious learning goals while increasing authority and accountability at the school and classroom level. Systemic reform also requires a consensus among educators and the public concerning the ambitious learning goals for all students.

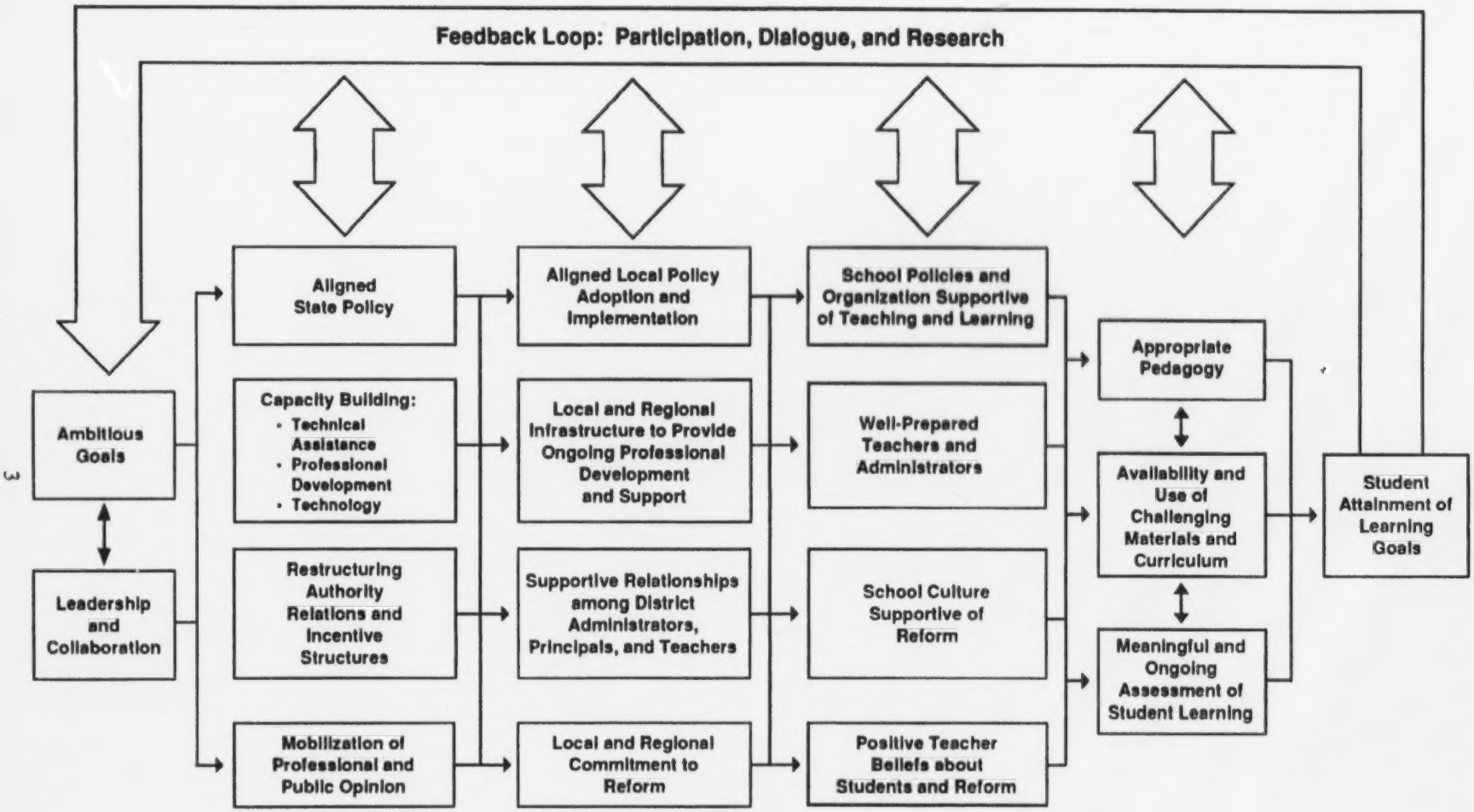
Feedback Loop: Participation, Dialogue, and Research
Ambitious Goals
Leadership and Collaboration
Aligned State Policy
Capacity Building:
• Technical Assistance
• Professional Development
• Technology
Restructuring Authority Relations and Incentive Structures
Mobilization of Professional and Public Opinion
Aligned Local Policy Adoption and Implementation
Local and Regional Infrastructure to Provide Ongoing Professional Development and Support
Supportive Relationships among District Administrators, Principals, and Teachers
Local and Regional Commitment to Reform
School Policies and Organization Supportive of Teaching and Learning
Well-Prepared Teachers and Administrators
School Culture Supportive of Reform
Positive Teacher Beliefs about Students and Reform
Appropriate Pedagogy
Availability and Use of Challenging Materials and Curriculum
Meaningful and Ongoing Assessment of Student Learning
Student Attainment of Learning Goals

FIGURE 1 A FRAMEWORK FOR EVALUATING SYSTEMIC REFORM

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At the classroom level, the attainment of learning goals is tied to their exposure to appropriate pedagogy—one that promotes critical thinking, problem solving, active engagement, and deep understanding of concepts and principles. Attainment of learning goals is also tied to student exposure to rigorous curricula and instructional materials, and the use of new assessments that are aligned with both appropriate pedagogy and the challenging curricula. At the school level, the theory assumes a set of policies and practices, as well as a school culture, that support teaching and learning. At the heart of systemic reform are well-prepared teachers and administrators with high expectations for and positive beliefs about their students. Similarly, Figure 1 depicts a set of conditions at the district level that support efforts in the school and classroom.

This theory of systemic reform is, of course, just that—a theory, consisting of a set of interrelated hypotheses based on uneven empirical evidence. We do not use it here as a set of criteria against which to judge the SCF projects. The projects' effectiveness can only be judged relative to their impacts on the system of mathematics and science education. The usefulness of the systemic reform model is that it provides us a road map of the educational system, allowing us to pinpoint where we would expect to see SCF projects' impacts. For example, curriculum frameworks are designed to translate the emerging national standards to state policy makers, district officials, and local educators. Curriculum frameworks should inform all components of the education system. We expect to see the short-term impact of curriculum frameworks on the alignment of state and local policies and in the mobilization of professional opinion. In the case of the projects' model guidelines for effective approaches to teacher education and certification and criteria for teacher recertification, we expect to see short-term impacts on the states' certification and recertification policies. With the model professional development programs, we expect to see short-term impacts on the states' capacity to provide effective professional development.

In summary, then, we are examining the framework projects as an explicit federal effort to support comprehensive, standards-based reform in the states. States, in turn, agreed to an ambitious reform agenda. The states took on these challenges in the context of an array of other educational reform efforts already under way, funded with both state and federal dollars. The purpose of this interim report is to track the progress of states in meeting these challenges.

Evaluation Purposes, Research Questions, and Methods

The overall purpose of the evaluation is to assess the degree to which the framework projects have contributed to the improvement of mathematics and science education in their states and to explain their success and limitations. We expect to reach this end through stages involving:

- a description of the organization and development of the state curriculum projects;
- an analysis of the projects' products and activities and their quality; and
- an analysis of the impacts of the projects on the state of mathematics and science education.

The focus of this first year's report will be on the organization and development of the projects and on their progress in developing products and services. Our focus on the projects' development and progress allows us to identify key issues that the projects will continue to face in the future, as well as some issues that are likely to emerge as the projects enter the implementation stage. This report does not include an analysis of the quality and impact of the projects' products and activities. Given the status of the products and activities, it is simply too early to complete such an analysis in the vast majority of the projects. However, we do include a section on the quality of the framework documents generally, based exclusively on an expert analysis of a sample of documents that was sponsored jointly by this study and one conducted by the Council of Chief State School Officers (Blank and Pechman, 1995). Although only a few of the projects' drafts were included in that analysis, the experts raised important issues relevant to all frameworks.

Research Questions

In addition to this first interim report, the evaluation of the State Curriculum Frameworks Projects will produce a second interim report in September 1996 and a final report and a summary report in September 1997. We will address an increasing number of the research questions that guide the study with each successive report. Exhibit 1 illustrates the research questions and the timeline for addressing each question.

Exhibit 1

RESEARCH QUESTIONS FOR THE STATE CURRICULUM FRAMEWORKS PROJECTS AND REGIONAL CONSORTIUMS PROGRAM

Research Questions	First Interim Report	Second Interim Report	Final Report
Organization and Development of the State Curriculum Frameworks (SCF) Projects			
How well did the SCF projects complement other significant education reform efforts in the states (e.g., SSI)?	✓	✓	✓
What is the relationship between SCF projects and other systemic initiatives in the state (e.g., SSI)? What state characteristics promoted successful SCF project activities?	✓	✓	✓
How did activities in states with SCF project grants differ from states without these federal grants? What difference did the federal support make?			✓
How did the development of curriculum frameworks in mathematics and science differ from the development of frameworks in other disciplines in the states?		✓	✓
How did the distribution of resources vary across the SCF projects?		✓	✓
How did the process of developing curriculum frameworks vary across states? Who was included in the development of the curriculum frameworks? Who was excluded?	✓	✓	✓
How did the states balance the need for expertise in the development of curriculum frameworks and the need for broad participation in the implementation of the frameworks? How successful were SCF projects at building consensus about mathematics and science education reform? How widespread was participation in the projects?	✓	✓	✓

Exhibit 1 (Concluded)

Research Questions	First Interim Report	Second Interim Report	Final Report
State Curriculum Frameworks Projects' Products and Services			
How did the states define a curriculum framework? How do the curriculum frameworks differ among the states?	✓	✓	✓
How many states developed curriculum frameworks and completed their other activities? What were the major barriers?	✓	✓	✓
Was there any organized resistance to the development of curriculum frameworks or other SCF project activities? What is the position of those in opposition?		✓	✓
Where did the ideas for the specific design of the curriculum frameworks and other related initiatives come from? Did the states use existing frameworks as a guide?	✓	✓	✓
What is the extent and impact of assistance and collaboration between the SCF projects and the Regional Consortia?	✓	✓	✓
Are the states' assessments, teacher preparation and accreditation, textbook adoption policies, staff development, and technology policies aligned with their curriculum frameworks?			✓
State Curriculum Frameworks Projects' Products and Services			
To what extent are the frameworks and framework-related activities consistent with emerging national standards in mathematics and science education?		✓	✓
Which SCF project activities contributed to improvements in mathematics and science education? Which were less successful?		✓	✓
What evidence exists to suggest that completed curriculum frameworks and other policy changes are being implemented?			✓
How have the SCF projects promoted changes in state and local policies affecting mathematics and science education?			✓
How do the SCF projects fit with the federal strategy for the improvement of mathematics and science education?	✓	✓	✓

As the exhibit illustrates, we are not scheduled to address many of the key research questions until later reports. We have targeted the limited resources of the study on data

collection activities that are most likely to answer issues of impact. Thus, our on-site study of the projects is timed to take place as the frameworks and other products are completed.

Methods

In this first year of data collection for the evaluation of the framework projects, our activities were focused on the organization and development of the projects. Thus, our data collection activities were:

- review of State Curriculum Frameworks Project documents, including original proposals, continuation proposals, draft and completed framework documents, and available evaluation materials;
- review of state data from a variety of secondary sources; and
- telephone interviews with project directors, state officials, key participants, and Regional Consortia directors.

In addition, we were able to take advantage of data collected through a number of other studies. We purposefully designed the data collection to coordinate our efforts with two other efforts: the national evaluation of NSF's Statewide Systemic Initiatives (SSI) program and the aforementioned analysis of the quality of curriculum frameworks carried out by the Council of Chief State School Officers. This coordination resulted in benefits and significant additions to the data collected through this contract's funds. First, our coordination efforts allowed us access to internal case study reports on 10 of the State Curriculum Frameworks Projects that were located in states that also had SSIs. These case studies were particularly valuable because all SSI researchers had been trained to include questions about curriculum frameworks in their interviews. The coordination efforts also took advantage of overlapping staffing among the studies. For example, the study director conducted nearly 30 days of on-site research in four of the curriculum framework project states as part of his SSI research assignments. Our coordination efforts with the CCSSO study also made possible the use of an important analysis of a sample of existing frameworks, as well as baseline data on frameworks in all 50 states and the District of Columbia.

Organization of the Report

We focus this year's report on the organization and development of the projects and the projects' progress on developing products and activities, while raising issues that we

will examine in subsequent reports. We begin with a discussion of the progress of the State Curriculum Frameworks Projects by examining both the status and progress of the curriculum frameworks and the other products and activities (Section II).

We then turn to the process of developing the products (Section III). In this section, we examine the writing and reviewing processes and outline the key issues that emerged out of the development process. In Section IV, we describe our early efforts to assess the quality of the frameworks. Here we rely on our collaborative efforts with the CCSSO study and the experts' work for both studies. We focus this section on the procedures for analyzing frameworks and the issues that emerged from the experts' analysis of 23 frameworks, most of which were draft documents from the projects.

In Section V, we begin to identify the opportunities and challenges facing the projects as they attempt to improve mathematics and science education. Finally, in Section VI, we raise issues about the challenges facing the states and the projects as they attempt to use the frameworks and other products to lead to changes in schools and classrooms.

II THE PROGRESS OF THE STATE CURRICULUM FRAMEWORKS PROJECTS

We begin the evaluation report by addressing two key questions: What did the framework projects set out to do? How much progress have they made in meeting their objectives? We discuss the curriculum framework documents first and then review our findings about the development of other products: model guidelines for teacher education, criteria for recertification, and model professional development programs. A central finding is that project staff began with a clear vision of what frameworks were supposed to be and have made significant progress in putting documents together. The vision regarding the other documents and activities has been much less clear, and states' progress has been much more uneven.

Status of Frameworks

States began their efforts with a similar view of frameworks, their purpose, and their audience. Across states, framework project staff consistently expressed a conception of frameworks similar to that outlined in the original solicitation: as a bridge between national standards and local practice. Thus, the projects followed the solicitation which explicitly required projects to build on the standards developed by the National Council of Teachers of Mathematics (NCTM, 1989) and the emerging standards in science under development at that time by the American Association for the Advancement of Science (AAAS, 1993), the National Science Teachers Association (NSTA, 1991), and the National Academy of Sciences (NRC, 1994). Thus, state officials viewed the project's role as communicating and adapting these national standards for its particular student population. In keeping with that view, project staff saw local educators, especially teachers, as the key audience for the documents.

In Exhibit 2, we outline the content area focus of each of the states' framework efforts, how each defined the purpose of the frameworks, and the intended audience. In terms of content, all but two states (both in the first cohort, funded for 1992 to 1995) are developing frameworks in both mathematics and science. Importantly, a few states (New York, Oregon, and Wisconsin), are seeking to develop a single framework that will guide the integrated study of mathematics, science, and technology. As we discuss later, creating integrated frameworks is a significant challenge, in part because there are no ready-made models to follow and no national standards to serve as the basis for framework development.

Exhibit 2

SELECTED CHARACTERISTICS OF CURRICULUM FRAMEWORKS

State	Content Area	Framework Defined	Intended Audience
AK	Math and Science	Content, process, curricular goals, context, and assessment	Curriculum developers, secondary teachers, and administrators
AZ	Math and Science	"Professional guide" translating pre-existing documents for teachers	Teachers
AR	Math and science	Provide direction to local educators that also allows flexibility and creativity in designing curriculum	Districts, and teachers
DE	Math and science	Standards, and instruction and assessment activities for math and science	Districts and teachers
DC	Math and science	A vision for math and science that has evolved into guidelines for teaching	Teachers, decision-makers, and community
FL	Science	A map to guide districts and schools in science curriculum reform	Science specialists, teachers, and district curriculum developers
LA	Math and Science	Reference for school and community efforts to advance reform	Teachers, schools, and districts
ME	Math and Science	A systemic blueprint for mathematics and science education	Teacher-based curriculum committees, curriculum coordinators, and superintendents
MA	Math and Science	Tool for planning instructional programs	Districts, schools, higher education, and teachers
MI	Math and Science	Means for helping schools meet state core curriculum mandates	Teachers
NE	Math and Science	Guide for local development of curriculum that meets national standards	Teachers and higher education
NJ	Math	Document to assist districts in implementing standards	District leadership teams and schools
NY	Integrated Math, Science, and Technology	A bridge between national standards and classrooms	Educators and the public
OR	Integrated Math and science	A bridge between national standards and local efforts	Teachers, administrators, school boards, parents, and community
RI	Math and Science/Technology	Not explicit. Contains only standards and benchmarks for content	Schools and teachers
WI	Integrated Math, Science, and other areas	Design tool for teachers to develop integrated curriculum	Local educators

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Projects use a wide range of vocabulary to define their frameworks—"design tool," "map," "guide," "bridge," "direction," etc.—all of which reflect a similar purpose: helping educators who are closer to students (at the district or school level) to improve content and instruction in line with national standards. The consistent references to national standards reflect the apparent consensus among project staff that these standards should form the basis for high-quality mathematics and science education. That consensus is most visible in the vision statements of the various frameworks. For example, states as different as Arkansas and Massachusetts appear to share a vision that is grounded in greater excellence and greater equity in mathematics and science education. The Arkansas mathematics framework states:

> *The framework encompasses five major goals that are articulated throughout the document. These goals suggest that all students should learn to value mathematics, become confident in their own ability to do mathematics, become mathematical problem solvers, learn to communicate mathematically, and learn to reason mathematically.*

The Massachusetts mathematics framework expresses its vision similarly:

> *Envision schools where all learners—not just those who aspire to be scientists or mathematicians—discover the power of mathematics, science and technology and develop the ability to reason scientifically and mathematically as they investigate and solve complex problems using the tools they need.*

Just as framework authors expressed similar visions in their frameworks, they also directed the documents to similar audiences. Most framework documents have multiple audiences, but nearly all documents include teachers as a key audience. The New Jersey Mathematics Curriculum Framework is typical of documents that explicitly define their audiences:

> *The New Jersey Mathematics Curriculum Framework addresses two audiences. First, it speaks to school and district personnel who intend to implement the standards comprehensively and systemically, by bringing about change in all of their classrooms. Second, it addresses teachers who are interested in implementing the standards in their own classrooms.*

The reference to teachers as a key audience for the curriculum framework documents should not be read too literally—that is, states do not necessarily believe that classroom teachers will take the framework document and use it in their classrooms tomorrow morning. In fact, many states that target teachers as an audience do not make enough

copies of the frameworks to reach even 10 percent of the teachers in the state. In such cases, other mechanisms for reaching the teachers are often—though not always—used, such as conducting a series of workshops directly based on the frameworks. We will address the frameworks' impacts on teachers (as well as on other audiences) in future reports.

Progress on Development of Frameworks

Given both an agreed-on purpose and the prominence of the frameworks, the State Curriculum Frameworks Projects have focused most of their time, energy, and resources on the development of curriculum frameworks. As a result, they have made good progress on the development of the documents. Exhibit 3 illustrates the status of the frameworks as of Spring 1995. All of the Cohort 1 states (those funded for 1992 to 1995) have completed draft frameworks. Two states, Florida and Nebraska, have produced final versions of these documents, which are currently being disseminated within the states. Among the Cohort 2 states (funded for 1993 to 1996), only Delaware has finalized its frameworks, but most have completed drafts that are being reviewed and revised. Only Arizona, Oregon, and Wisconsin have not finished drafts of any proposed frameworks. Overall, the 16 framework projects proposed to develop 28 frameworks; of these, 22 drafts or final versions have been completed.[1]

Regardless of the extent of the overall development process, most states reported that they wished that they had more than 3 years to complete the project. In Arizona, project leaders estimate that they are about 6 months behind because of personnel changes and the slow state hiring process. In New Jersey, similar delays occurred when the state was unable to identify department staff to work on the project with the New Jersey Mathematics Coalition. Even without bureaucratic snags, project directors would have liked more time. As an informant from one project put it, meeting the goals of the project "takes more than 3 years; it takes closer to 5 years." A number of states have already indicated that they are likely to request a no-cost extension of the grants.

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[1] We calculated the number of proposed frameworks as follows: 10 states proposed to develop frameworks in both mathematics and science (n = 20); 5 states proposed developing a single framework (n = 5); 1 state, Louisiana, proposed three frameworks (two in mathematics for different grade levels and one in science) (n = 3).

Exhibit 3

STATE PROGRESS ON CURRICULUM FRAMEWORKS

State	Status
Cohort 1	
District of Columbia	Draft completed: review and revision in progress
Florida	Completed
Nebraska	Completed
New Jersey	Draft completed: review in progress
New York	Draft completed: revision in progress
Rhode Island	Drafts completed: review and revision in progress
Cohort 2	
Alaska	Draft completed: review in progress
Arizona	In progress: drafts expected summer 1995
Arkansas	Mathematics completed; Science in progress
Delaware	Completed
Louisiana	K-8 math draft completed: review in progress; K-8 science in progress, draft expected summer 1995; 9-12 math in progress
Maine	Draft completed: review in progress
Massachusetts	Second draft completed: review in progress
Michigan	Math draft completed; science in progress: draft expected summer 1995
Oregon	In progress: frameworks being developed at local level
Wisconsin	In progress: interactive CD prototype due in summer 1995

The relative progress of the framework projects reflects a combination of factors, including the status of state reforms at the inception of the project, the extensiveness of participation in the development and review process, the degree of innovation in the proposed framework (e.g., discipline-specific versus integrated frameworks), and a host of political and administrative factors. We address these issues in greater detail in our discussion of the development of frameworks in the next section of this document.

Status of Other Products and Activities

The framework projects do not share as clear a consensus of definition, purpose, and audience in the development of other products as they do with curriculum frameworks. Projects vary widely on how they conceive of and address the development of model guidelines for teacher education and certification, criteria for teacher recertification, and model professional development programs. In a few cases, the project staff set out to create entirely new products on the order of magnitude of the frameworks themselves—for example, developing, piloting, and disseminating a model teacher education program or designing and codifying a new teacher recertification policy. However, there is a good deal of variation in what the states actually did with each component. For example, Arkansas, the District of Columbia, Florida, Nebraska, and New Jersey have concentrated their model professional development components on disseminating the frameworks, while Michigan and New York have tried to pilot models of good professional development in selected schools. Some projects have been able to tap into or coordinate with other resources. For example, Louisiana has been able to work with National Science Foundation projects (SSI and Teacher Collaboratives) to address such issues as teacher education and model professional development.

In some instances, the project has not actually developed a series of other products, but rather used the frameworks in some extended form. For example, Florida addresses the issue of teacher education in *Science for All Educators*, a companion to the framework document; New Jersey disseminates the framework document to teacher education institutions; and Maine's model of good professional development is part of its framework.

Progress of Other Products and Activities

The unevenness with which the states have addressed the development of other products reflects in part the almost universal perception of model guidelines and the like as secondary to framework development. All the framework projects turned first to frameworks, and all, as reported above, made significant progress in their development. This approach reflected the U.S. Department of Education's original intention that the frameworks would serve as the basis for developing the other products and activities called for under the grants. Not surprisingly, then, the framework projects have made less progress in developing model guidelines for teacher education and certification, developing new criteria for teacher recertification, and building model professional development pilots.

In Exhibit 4, we describe the progress of the framework projects in developing these other products and activities as of Spring 1995. Overall, the pace of development is strikingly uneven across states and activities. Beginning with model guidelines for teacher education and certification, we find only two states (Delaware and New York) that have actually drafted guidelines. In two other states, the framework project is taking advantage of the work done by another federally funded initiative (SSI in Arkansas and NSF-sponsored Teacher Collaboratives in Louisiana) to handle the model guidelines for teacher education and certification. But most states, are still working on initial drafts of the guidelines. New Jersey's original proposal did not include work on model guidelines for teacher education and certification (or criteria for teacher recertification). Rhode Island dropped all work on the other products through an agreement with ED.

We see a similar pattern when looking at progress on criteria for teacher recertification. Only Massachusetts has completed a concrete plan. A number of states are in the process of developing such criteria and a plan for their use. However, three states have not begun addressing this issue, and two states do not have recertification as part of their projects.

The story of states' efforts to develop and pilot model professional development programs contains the same themes. Three states have completed drafts and are piloting them (Alaska, Michigan, and New York). Most states are still in the early stages of their model professional development component. A few states are simply using the inservice training that accompanies the dissemination of the frameworks to model good professional development. For example, Oregon officials decided to weave their professional development programs into the development of their framework. Often, in Nebraska and New Jersey, the professional development activities centered on introducing teachers to the curriculum frameworks.

Again, the slower development of these additional products relative to the frameworks is to be expected because the frameworks are supposed to guide the drafting of these various guidelines and criteria. Differences across states are due, as in the case of the frameworks, to a variety of contextual and strategic factors, which we turn to in the next section.

Exhibit 4

STATE PROGRESS ON OTHER PRODUCTS AND ACTIVITIES

State	Model Guidelines for Teacher Education and Certification	Criteria for Teacher Recertification	Model Professional Development
Cohort 1			
District of Columbia	In progress	In progress	In progress
Florida	Addressed in framework	Addressed in framework	Developing training on framework
Nebraska	In progress	In progress	Framework-based training
New Jersey	Distributed standards to IHEs	None	In progress
New York	Drafts completed	In progress	Pilot programs in place
Rhode Island	None	None	None
Cohort 2			
Alaska	In progress	In progress	Completed
Arizona	Planning	Planning	Planning
Arkansas	SSI and Goals 2000 addressing these issues	Not yet begun	Framework-based training
Delaware	Piloting model teacher education	Not yet begun	Planning
Louisiana	Teacher Collaboratives and SSI addressing these issues	Not yet begun	Using SSI model
Maine	In progress	In progress	In frameworks
Massachusetts	In progress	Completed	Drafts completed
Michigan	Drafts expected 1995	In progress	Pilot programs in place
Oregon	Taken over by state task force	Taken over by state task force	Planning
Wisconsin	Planning	Planning	Planning

III UNDERSTANDING THE PROGRESS OF THE STATES: THE DEVELOPMENT AND ORGANIZATION OF THE PROJECTS

To understand the progress of the projects, it is necessary to examine the development of their products. In this section, we first turn to a discussion of the writing and review of the curriculum frameworks. We then discuss some of the key issues that came out of the development process and describe how the projects dealt with those issues. Next, we describe the development process for the model guidelines for teacher education and certification, criteria for teacher recertification, and model professional development programs. Finally, we discuss some of the issues involved in the development of these other products and activities.

Writing and Reviewing the Framework Documents

The 16 projects developed or are developing their frameworks in similar ways. All projects formed design teams, and all set up a formal review process. States differ, however, in approval requirements. About half the states require formal approval by the state board of education, while the other half have no formal approval process. Exhibit 5 describes the writing, review, and approval processes in the 16 projects.

Although the State Curriculum Frameworks Projects had wide latitude in how they developed their curriculum frameworks, ED required the participation of "college and university scholars and specialists as well as teachers and administrators from public and private schools" in the design of the frameworks. Given that direction, all of the projects formed such committees and relied on similar organizational structures in developing the frameworks.

Typically, the planning for the project and the preparation of the application were led by the state department of education (New Jersey is the exception in that efforts were led by the New Jersey Mathematics Coalition, housed at Rutgers University). The state department would usually consult with key stakeholders in the state, especially in the case of the SSI states. Delaware provides a typical example. The major reform initiative in the state, New Directions, called for the development of curriculum frameworks in early 1992, prior to the framework project. The state developed 45-member commissions in mathematics, science, English/language arts, and social studies. These commissions included at least one representative from each school district (teachers), universities, SSI, Eisenhower Regional Consortia, business, and Professional Standards Council.

Exhibit 5
FRAMEWORKS DEVELOPMENT

State	Development	Review	Approval
Alaska	137 K-12 and higher educators, Alaskan Natives, students, and general public.	Draft frameworks reviewed by Oversight Committee, college educators, and interested professional associations.	Voluntary, no state approval needed.
Arizona	Development by several subject area and constituent teams.	FWRC evaluation contract, peer review by math and science educators from other states.	Missing data.
Arkansas	SEA team guided math and science educators and community members. Pilot districts wrote model curriculum guides.	Frameworks sent to all districts for two rounds of reviews and regional meetings.	State Board approves framework structure; SEA will develop the final version.
Delaware	Commission of teacher, university, business, and RBS representatives.	All teachers; university educators; specialists from other states; state panel	State Board of Education approval scheduled for June 1995.
District of Columbia	Teacher writing teams with expert advisors and editors.	Informal review by several audiences.	No formal approval process.
Florida	Committee of K-12 and secondary educators, district representatives, and a curriculum specialist.	Advisory committee, additional science educators, and formal review meetings at regional centers.	Voluntary, no approval needed.
Louisiana	Two to three teachers with review by SEA, university, scientist, and other committees.	Math framework reviewed by 90 teachers; science framework not complete.	Board of Education, state legislature.
Maine	PK-12 teachers, SSI representatives, university faculty, administrators, students, and community representatives.	Drafts distributed widely and presented at meetings; 10 paid reviewers (teachers, IHE faculty, scientists) and 6 pilot schools.	Voluntary, none needed.
Massachusetts	SSI teachers, math and science specialists, public and private K-12 and college educators, and other experts.	Dissemination just under way.	State Board of Education.
Michigan	State officials; K-12 and college educators.	Prior document, Science Goals and Objectives, reviewed by CCSSO.	State legislature approved standards in the frameworks; State Board of Education approves frameworks.
Nebraska	Classroom teachers with support by SEA staff.	Advisory board reviewed framework drafts; evaluation by Lincoln-based Gallup (McREL was original evaluator); CCSSO reviewed science framework.	State Board of Education approved frameworks in March 1994.
New Jersey	K-12 and college educators, administrators, and representatives of business, industry, and DOE.	7,000 copies of standards; 3,000 copies of framework currently being distributed.	State Board of Education.
New York	42 teachers, administrators, specialists, and professors.	Widely distributed (over 100,000 copies).	Board of Regents.
Oregon	Curriculum Frameworks Council appointed by Superintendent; 14 local projects.	CD-ROM with project portfolios to be distributed to each district.	District responsibility.
Rhode Island	Practitioners, professors, SEA staff.	1,000 copies of science framework distributed to interested parties.	No formal process.
Wisconsin	40 K-12 and college math and science educators.	SEA oversight and management body; 70-member FISM-CTC joint advisory team.	Missing data.

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The commissions operated for nearly a year before the frameworks grant, generally familiarizing themselves with the national standards and frameworks. The science supervisor for the state education department actually wrote the proposal for the Eisenhower State Curriculum Frameworks Project. Eisenhower funds allowed the process of developing the mathematics and science frameworks to move more quickly.

As in the Delaware example, states usually appointed a design team or commission that went beyond the representation that ED required. Typically, states formed groups made up of teachers, administrators, subject specialists, and university faculty, and occasionally representatives of professional organizations, business, and the general public, to oversee the design of the frameworks. In Massachusetts, the Curriculum Framework Development Committee was selected to be representative and to help forge links between the project and the state's SSI. The committee included:

- three teachers involved in SSI;
- specialist mathematics and science teachers from high schools selected from lists presented by state professional associations;
- college and university scholars and specialists associated with the SSI, including professors who had taken part in the SSI institutes;
- teachers and administrators from private and parochial schools; and
- experts from public and private universities, teacher associations, and educational research and development agencies.

The actual writing of the frameworks usually was the responsibility of subgroups of the larger committees. Nebraska's and Louisiana's actual writing teams were made up exclusively of teachers. This strategy was used to try to increase teacher acceptance of the frameworks.

Oregon's development process stands out as a unique approach. Oregon's state legislature had previously adopted the NCTM standards, and state officials wanted their State Curriculum Frameworks Project to directly support the education reform efforts mandated in the Oregon Education Act. Thus, state officials decided that it was unwise and unnecessary to develop one curriculum framework that might be viewed as an attempt by the state to dictate to the local districts. Instead, Oregon's unusual framework project involves the development of frameworks in 14 local districts. A design committee was formed to prepare a Request for Proposals (RFP) to guide the development of the

individual projects. The plan is to collect portfolios of each project, place them on CD-ROM, and distribute them statewide. The state's internal evaluation, reporting on the first half of the project's second year, reported that the 14 projects were bolstering efforts "to improve science and mathematics instruction and to align it with the Oregon legislature's requirements." However, the report also indicated that some of the individual projects had start-up problems and needed clarification of their goals (Davis and Larson 1995). Although the Oregon approach raises important questions about quality and statewide implementation, it appears to be a pioneering effort to come to grips with one of the fundamental tensions inherent in the standards movement—the tension between state and local control.

Although states proceeded with the review process in different ways, most states tended to view this aspect of the project as crucial. Some states, like New York, Arkansas, Delaware, Massachusetts, and New Jersey (in the case of its standards document), undertook an extensive review process. New York officials argued that for their state the review was the most important part of the process, because it was designed to build a statewide consensus. The project leaders designed an extensive review process that included the printing of over 100,000 copies of the draft document. As a result of their experience with the State Curriculum Frameworks Project, the New York State Education Department developed a guide for framework development that defines the stages of development as:

- development of the content standards and a preliminary draft of the framework by a Curriculum and Assessment Committee and some consultant writers, under the guidance of the state education department's Curriculum and Assessment Council and the Commissioner;
- review of the preliminary draft framework by the Commissioner and the Curriculum and Assessment Council, and subsequent revision by the writers as indicated;
- approval of the preliminary draft by the Board of Regents for distribution to the field, and continued development in consultation with teachers and other informed advisors;
- dissemination to the field through mailing to schools, reviewers, and professional organizations, as well as distribution at public meetings;
- solicitation of input from public meetings and requests for expert review. Also, involvement of teachers in developing assessment models related to the content

standards, and providing samples of student work that reflect acceptable and outstanding levels of performance;

- presentation of the revised framework to the Board of Regents for approval; and
- production of an assessment item bank and a teacher resource manual.

Other states have taken a different approach to the review of the draft documents. In Louisiana, 90 teacher reviewers were selected through a stratified random sample. The sample was selected by using a profile of the state in terms of ethnicity, school size, and socioeconomic status. Each of the state's 66 districts was represented, and larger districts had two reviewers. This review process was designed to generate a manageable number of comments and to focus on how teachers responded to the framework.

The contrasting review strategies of New York and Louisiana reflect different approaches to the process of producing a framework. Some projects used a relatively small number of authors and reviewers to produce their documents. Others opted for a bottom-up approach that was concerned primarily with generating a thoughtful public conversation about mathematics and science education. Thus, the procedures that individual projects followed, as well as those that ED required, reflect basic differences in strategies and philosophies. Those differences will be increasingly important as we follow the progress of the projects over the next few years.

Issues Involved in Developing a Framework

As the previous discussion suggests, there are important issues embedded in the development process itself. Here, we highlight three issues that emerged in the states as they went about the process of developing the frameworks.

Achieving Coherence between the Frameworks and Preexisting Curriculum Guides

All project states have issued curricular guidance over the years. Because the new frameworks were likely to be a significant departure from the older guidance, project leaders and design teams had to think about how to make a coherent transition from old to new. Although it is too early to expect the framework projects to have resolved the issue of coherence between the frameworks and preexisting guidelines, the success of the projects may depend largely on how the documents are received at the school and classroom levels. As Cohen and Spillane (1994) predict:

> If American politics and education run true to form, reformers will do better at addition than subtraction. They will introduce many different schemes to make education more consistent, but they will be less able to produce consistency among those schemes, to greatly reduce the clutter of previous programs and policies, or to fundamentally change teaching.

Although the degree of difference between old curriculum guides and the new frameworks varied, the differences could be significant. Many documents from the 1980s and early 1990s were in the form of lists of essential skills that teachers were expected to instill in their students. The new curriculum frameworks generally avoid long lists of discrete skills and tend to give more general guidance on content, pedagogy, and school and classroom environment. In most states, the contrast between the old curriculum guides and the new frameworks raises issues about how the latter will be received by teachers. One informant expressed concern that there would be some teacher panic when the new frameworks are released. "It's not that the content is so different, but the methodology is very different."

The basic problem is that unless framework audiences understand the difference between the newer and older curriculum documents, frameworks may be seen as just more irrelevant booklets for the shelves. States have used three general strategies in an attempt to ensure that audiences, especially teachers, understand the frameworks. Some states, like Arizona, have attempted to modify their existing documents. In Arizona, the state followed the national basic-skills trend by enacting legislation on "Essential Skills," which have themselves evolved from checklists to a statewide plan for curriculum standards and a performance-based assessment system. Although the skills are detailed and objective-based, they do emphasize higher-order cognitive processes, and the content is informed by national standards. Consequently, the Essential Skills documents in mathematics and science form the basis for the development of *Enhancing State Mathematics and Science Curriculum Frameworks—A Professional Guide to Systemic Reform*, the main product of the Arizona framework project.

Other states, like Michigan, are attempting to make explicit linkages between preexisting documents and the new frameworks. In Michigan, the project is building on earlier efforts to develop and approve "essential skills and objectives" in different subject areas. In science, the project is extending the *Michigan Essential Goals and Objectives for Science Education* (1991) by developing curriculum guides (also known as "extended curriculum frameworks"). In mathematics, the project is undertaking more substantial

revisions of the 1988 document *Michigan Essential Goals and Objectives in Mathematics Education*.

A third strategy is to start fresh and make it clear that previous curriculum policy documents are out-of-date. This strategy has the advantage of signaling audiences that it is time to think about mathematics, science, and technology education in a new way, as in New York. Arkansas applied a similar strategy. Signaling the need for a major change was consistent with the messages from the state's governor and education leadership, as well as the state's SSI.

Both those involved in developing the frameworks and many of the reformers are painfully aware of the problems of inconsistency and clutter in the policy arena. It remains to be seen whether the new curriculum frameworks will add to or subtract from the clutter and noise.

The Role of Technology in the Frameworks

The process of developing draft framework documents helped surface serious debates that reflected some of the unresolved tensions within and between the disciplines. One unresolved debate centers around technology's place in the frameworks. Most states attempted to include statements about technology, but the debate in two of the states raised an important and unresolved question: Should technology be treated as a discipline on an equal footing with mathematics and science?

In most states, the frameworks cite technology as being important for a variety of reasons. In particular, the frameworks mention that technology enables students to:

- perform rote tasks and computations, freeing up the learners' time for thinking and reflection;
- represent and manipulate conceptual ideas in concrete or visual form. As part of this ability, students can perform experiments that otherwise might not be available to them (e.g., through computer simulations of dangerous experiments or by using spreadsheets to manipulate data);
- gather, organize, display, save, and manipulate data. As part of data gathering, students are able to search and access diverse information by connecting to many libraries and other data sources;
- collaborate and communicate with other students, educators, and scientists; and

- overcome or compensate for physical difficulties.

In addition to stressing the importance of technology as a *tool* for learning math or science, some frameworks, like the Florida science framework, argue that students' use of technology is important *in and of itself* because students will be faced with a world in which they must use technology.

Most documents recommend that schools have adequate technology and, stressing equity considerations, recommend that all students have access to calculators and computers. Alaska goes even farther in this regard, including a list of the necessary equipment for each classroom:

- one complete set of calculators for each science and math course
- one computer for each teacher, networked to the school system
- one computer for every four students in the class as the minimum
- one portable hypermedia station, including laser disc and CD-ROM for each school
- one set of probeware for each school (software and hardware for data collection)
- one classroom set of graphing calculators for each math course
- interactive software applications in algebra, geometry, trigonometry, and calculus
- graphing software (stand-alone or spreadsheet based)

However, in New York and Massachusetts, reviewers sparked a heated debate over the place of technology in the framework. In New York, where technology education is a state requirement for 8th-grade students, technology is treated as a subject (like engineering) rather than just a set of tools to help teach other disciplines. Some members of the science and mathematics communities expressed concerns that their disciplines were becoming subordinated. They objected to the technology teachers' view that mathematics and science are tools for teaching technology. Although the emerging document will reflect an integrated and interdisciplinary approach, interviews with about 30 New York teachers in mathematics and science demonstration schools suggest that most teachers do not view technology as a discipline.[2]

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[2] These data were gathered as part of the research on NSF's SSI program.

The debate in Massachusetts over the mathematics, science, and technology issue was less contentious, perhaps because the mathematics and science frameworks are separate. However, the objections of the technology community are likely to result in a science/technology framework when final revisions are completed. Other states have also been grappling with the place of technology in their frameworks, but few states have engaged in the debate over technology as a discipline as directly as New York.

Curricula Integration and the Interdisciplinary Approach

During the development process, most states have also begun to grapple with a related issue: curricula integration. Although only three states are developing frameworks that explicitly integrate mathematics, science, and technology, most documents encourage teachers to integrate the disciplines in their lessons. For example, the Nebraska mathematics and science framework document has separate sections for each discipline, but promotes integration in its introduction:

> Instructional programs which integrate curricula provide time to explore topics in greater depth and to focus on developing conceptual understandings rather than the memorization of a massive amount of terminology and facts. ... The mathematics and science frameworks provide a continuum that facilitates and encourages the integration of content with other areas of the curriculum....

The emphasis on curricula integration varies from framework to framework. New York, Oregon, and Wisconsin are attempting to produce fully integrated mathematics, science, and technology frameworks. For example, a draft of the New York document asserts in its first of five General Principles for Learning in Mathematics, Science, and Technology that: "The learning process in grades K-12 must be integrated not only across areas of study within mathematics, science, and technology, but also across other academic disciplines."

As we indicated, most states' frameworks encourage curricula integration to varying degrees. The reason may be that integration seems to fit well with the thematic approaches and constructivist learning often advocated by the frameworks. The frameworks may also encourage integration as part of general criticism of the disciplines as an outmoded way of organizing knowledge. However, recent research suggests that curricula integration is neither easy to do nor being done well (Gardner and Boix-Mansilla, 1994). Too often, thematic units lack rigor and are disconnected from disciplinary knowledge and the modes of thinking or interpreting the world that are inherent in each

discipline. As Gardner and Boix-Mansilla warn, interdisciplinary or thematic curricula are often used even "when students could not yet have mastered individual disciplines."

On the other hand, advocates of interdisciplinary study argue that discipline-based standard setting tends to solidify existing disciplinary boundaries, making interdisciplinary collaboration on standards fairly unusual (Kirst, 1994). Thus far, New York has tried to address these concerns most directly. Although the state's integrated mathematics, science, and technology framework is still in draft form, it makes a strong case for the importance of integration:

> A new kind of approach is needed to help students deal with the proliferation of knowledge. They should learn unifying concepts—the big ideas—that integrate knowledge. Besides decreasing the amount of content that has to be learned, the coming together of knowledge from different disciplines provides insights into the natural and technological world that goes beyond what can be learned in each discipline. The challenge is to design and implement an instructional program that helps students learn disciplinary concepts and skills in the context of unifying concepts and real-world systems and problems.

It remains to be seen just how challenging this curricular integration will be. Our observations of a few classrooms in New York where teachers are attempting integration suggest that thematic units can easily neglect both the big ideas and the disciplinary concepts and skills.[3]

Developing the Other Products

Because the projects are generally developing the other products late in the grant period, we know less about the development process. We do know that states that have completed or begun the development of model guidelines for effective approaches to teacher education and certification, criteria for teacher recertification, and model inservice professional development programs followed a variety of strategies. In contrast to the similar development patterns we saw with the frameworks, the development processes for the other products are decidedly uneven.

Some states followed organizational strategies similar to the ones they used to develop their frameworks. These states formed representative committees to oversee the design of the products. For example, Maine formed a Professional Development Action

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[3] These data were gathered as part of the research on NSF's SSI program.

Team to work on the preservice and inservice components of its project in September 1994. Membership on the team included representatives from "each level of education from pre-K to University, and all geographic areas of the state." New York formed a committee of college and university professors, consultants, teachers, administrators, and retired state department officials to write its model guidelines for teacher education and certification.

In contrast, Delaware gave grants to universities to undertake teacher education reform. The Delaware project granted 2 years of funding ($50,000 per year) to Delaware State University and 1 year of funding to the University of Delaware to develop preservice models. The grants were provided to reduce the class size of some university professors to give them time to think about how to redesign their classes to bring them into line with the frameworks. The results of these grants remain to be seen.

In some states, changes in leadership in the state interrupted the development of other products. For example, the Alaska project originally intended to present guidelines for alternative certification to the Board of Regents for approval and to recommend recertification criteria to the State Board of Education. A series of meetings with key stakeholders resulted in some tentative recommendations, but these activities are temporarily on hold while direction is sought from the new education commissioner.

Circumstances within states have also changed both the nature of and the timeline for some of the other products. For example, Oregon's legislature called on the State Board of Education and the State Board of Higher Education to form a joint commission to examine certification requirements in the state, thus superseding the project's efforts. In other states, existing state education department programs like Massachusetts' SSI or Arizona's Journey Schools Program simply took on responsibility for the project's professional development pilot.

Issues Involved in Developing the Other Products and Activities

In earlier sections, we have described the unevenness of states' conceptions of the other products and activities and their development. Although specific state circumstances are primarily responsible for differences in progress on the other products and activities, common issues are beginning to emerge.

First, although curriculum frameworks have policy implications, teacher certification and recertification requirements are often politically more contentious issues. As the

governor of New Jersey quickly discovered, the mere mention of recertification was greeted by a sharp negative response from the powerful teachers' organizations in the state. Indeed, New Jersey's original proposal anticipated such opposition and did not include a recertification product among its project's activities. In contrast, some states' reform agendas already included plans for new certification and recertification requirements. Massachusetts, for example, recently passed requirements designed to strengthen the preparation and continuing professional development of its teachers, and its project rightly takes credit for helping craft the new rules. Although the certification and recertification products envisioned by ED were simply advisory, they are vulnerable to the political volatility of the issues in each state.

Second, the importance that both states and the federal government have placed on framework development may tend to subordinate the importance of the other products. Nearly all states have developed or are developing curriculum frameworks, and standards-based reform has been the dominant state and federal reform wisdom for some time. The reauthorized ESEA Title I and the new Goals 2000 legislation have added to the pro-standards climate. For example, in the new Title I, states are required to develop or adopt "challenging content standards and challenging student performance standards" or "a strategy and schedule for developing" such standards (US Congress, PL 103-382). Given this climate, it is not hard to understand why framework development receives most of the attention in most states.

A final possible explanation for why we see slower progress on the development of the other products has to do with the very nature of the products. Whereas certification and recertification policies and model professional development pilots have direct operational effects on institutions and individuals, curriculum frameworks tend to have only indirect operational effects. As complex as framework development can be, frameworks cannot force changes in the same way that new teacher education and certification policies can force teacher candidates to take different courses or colleges and universities to change their practices. Frameworks do not draw the impassioned personal interest of teachers the way that stiffer (or new) recertification policies can.

IV QUALITY OF THE FRAMEWORKS

Once the projects have developed frameworks, as well as other products, we need to ask whether the documents are good ones. This presents a serious challenge for the evaluation, one that we are only in the early stages of addressing. Our first step has been to assemble a group of distinguished experts to establish criteria and review a sample of the documents. As we noted earlier, our collaboration with the CCSSO and its NSF-sponsored study of mathematics and science curriculum frameworks allowed us to begin this process. In January 1994, a group of experts working for both the CCSSO study and this study met to establish "Elements for Analyzing Curriculum Frameworks."

The group, which included nationally recognized mathematics and science education scholars and representatives from state departments of education familiar with curriculum frameworks development, emphasized the importance of understanding the state context in any examination of framework documents. Moreover, the experts agreed that assessment of a curriculum framework could not be based simply on the contents of a document. They argued that in the absence of an understanding of the process of developing and implementing of a curriculum framework, determining the "goodness" of a document was of limited value. The experts also warned against a comparative ranking of curriculum frameworks.

However, the experts did see value in analyzing curriculum framework documents to contribute to a broader understanding of the role and impact of curriculum frameworks in the improvement of mathematics and science education. Thus, the experts agreed that "Elements for Analyzing Curriculum Frameworks" should include:

- status of the framework in the state
- vision of science and mathematics education in the state
- function and intent of the curriculum framework
- approach of the framework as a policy statement
- conception of the curriculum
- content of mathematics and science curriculum
- presentation and communication of the content

- pedagogy
- equity
- enabling conditions
- policy connections/linkages

Under the auspices of the CCSSO study, the experts met again in Madison, Wisconsin, in August 1994 and were charged with applying the elements to 23 mathematics and science curriculum frameworks. The 23 frameworks included documents from only six states with curriculum framework projects. The experts reviewed draft documents from five of the states and a final document from one state. Thus, the issues that the experts raised are ones that we will need to address in future reports, but they are not an assessment of the quality of the projects' final framework documents.

The CCSSO report that culminated the NSF-sponsored study included a great deal of descriptive information about frameworks and raised important issues for curriculum framework development. Without identifying specific frameworks, the experts' findings included:

- State frameworks show marked progress in expanding beyond a basic-skills emphasis to instructional emphasis on higher-order skills for all students in mathematics and science.
- Frameworks differ in the degree to which standards statements and language are consistent with the expectations that national standards are establishing for students.
- Recent state [mathematics] frameworks show high agreement with emphases of NCTM curriculum standards. Below the major headings and categories for content, mathematics frameworks varied in how consistently the specific content topics or subheadings followed their own vision statement and NCTM standards.
- The majority of science frameworks reviewed by expert teams were written before the publication of the AAAS Benchmarks or the draft NRC Science Standards, and states had a less well-defined set of guidelines to use in developing their frameworks' standards, as compared with mathematics. Some states left out or gave less emphasis to key content areas that AAAS and NRC eventually included—nature of science, history of science, science as inquiry, science and society, and science applications.

- Recent frameworks all include a statement on the need for greater equity in mathematics and science education in the rationale or vision section, but a consistent weakness of frameworks is the lack of presentation of strategies and practices that promote equity.

- Recent frameworks generally recommend alternative assessment strategies for classrooms that are consistent with content standards, but typically they do not provide a strong link to reform of state assessment programs.

The experts in the CCSSO study found good progress in placing an "instructional emphasis on higher order skills for all students in mathematics and science." When the experts examined the frameworks' adherence to the national standards, they found that the frameworks reflected well the content themes in the national documents. However, they found that the frameworks less consistently carried the content and process goals in the national standards into their own examples. This is a difficult objective to achieve. Indeed, the experts observed that the national standards themselves are not always faithful to modeling the goals they espouse. At the same time, the experts acknowledged that adherence to the national standards may be an unrealistic expectation, given that both mathematics and science standards are still emerging. Indeed, NCTM's "Assessment Standards for School Mathematics" was just released, and NRC's "National Science Standards" is still in draft form.

Several of the findings raise important issues about the quality of the frameworks. In the case of mathematics frameworks, the finding that "Below the major headings and categories for content, mathematics frameworks varied in how consistently the specific content topics or sub-headings followed their own vision statement and NCTM standards" suggests that some documents lack internal consistency. In the case of the science frameworks, the finding that "Some states left out or gave less emphasis to key content areas that AAAS and NRC eventually included—nature of science, history of science, science as inquiry, science and society, and science applications" suggests that some frameworks are missing important content areas.

The finding that the frameworks lack the "presentation of strategies and practices that promote equity" speaks to the difficulty states are having in providing teachers with concrete examples that will help them address this issue. The finding that the frameworks "do not provide a strong link to reform of state assessment programs" raises the issue of the frameworks' power to influence operational policies.

States may consider these findings and criticisms controversial because they are based, in part, on the assumption that the quality of a framework lies in the document's adherence to national standards. Despite the fact that the emerging national standards enjoy a good deal of credibility among the professional elite of mathematics and science educators, it remains to be seen how widely they will be embraced by local administrators, teachers, and citizens.

In addition, some state officials took issue with the whole notion of having experts assessing the quality of their state's framework. As one project director argued:

> "If we're going to have a national framework, let's have a national framework and let's get on with developing that. I can live with either side, but as long as each state is developing its own framework, then don't compare mine and tell me I'm supposed to have all these other aspects of the framework."

This is an important challenge that raises questions about how the emerging national standards will be used. Despite the experts' insistence that the frameworks should not be ranked, state officials may feel that they are being ranked on the basis of how closely they mimic the national standards.

There is always the danger that a controversy over using national standards to assess curriculum frameworks could degenerate into political wrangling over federal interference in the local domain. More helpful would be a serious debate over what is a good framework in its state and local context. In the end, the quality of a framework is determined by what effect it has on student learning, and there is no guarantee that even the "best" curriculum framework will boost achievement for all students.

When we reconvene the experts in fall 1995 to look at a sample of framework project frameworks, they will revisit the issues they raised in the CCSSO study. In addition, the next round of expert analysis will benefit from site visits conducted by the study team to the states whose frameworks are analyzed. The results should help the experts assess the framework projects in a fuller context.

V IMPROVING MATHEMATICS AND SCIENCE EDUCATION: IMPLEMENTATION OF THE CURRICULUM FRAMEWORKS

The purpose of ED's state curriculum frameworks solicitation and the projects themselves is not, of course, to develop a set of documents or undertake a few activities to model good practice. Rather, the goal has always been to better the system of mathematics and science education and ultimately to improve teaching and learning in the classroom. Consistent with this goal, there is a gradual, albeit uneven, shift of emphasis across the states from development to implementation over the life of their grants. Along with this evolution toward a focus on improving the system come a set of new opportunities and challenges. At this point in the life of the projects and in our own data collection schedule, we cannot make evaluative judgments about how projects have taken advantage of these opportunities and met these challenges. We can begin, however, to identify these factors and report our preliminary data. As we begin on-site fieldwork in school year 1995-96, we will be paying close attention to how states deal with these factors and how those strategies affect the project's influence in improving the system of science and mathematics education.

In examining the implementation of the projects' products and activities, we do not mean to paint a simplistic picture of their evolution: that products are developed one day and implemented the next. In fact, we know that many states have explicitly designed their development processes to ensure that implementation begins during the development stage. Oregon, for example, provides funds directly to districts and teachers to rethink their curriculum and devise more effective strategies. New York distributes over 100,000 copies of its frameworks to teachers for review—in part to get practitioners' feedback and in part to begin to influence practitioners' thinking by instigating critical conversations about what students should learn. Still, in all states, there is a gradual shift from product development to putting those products in place and influencing the broader system. As this occurs in the evolution of the projects, we plan for our evaluation to evolve to focus more on system impacts.

In this section, we identify a number of key factors as potential challenges or opportunities for the implementation of the framework projects. How the projects address these challenges, we argue, will in part determine their success in improving the system of mathematics and science education in their states. We discuss first the dynamic nature of the state political context. We turn then to the relationship between the framework

projects and other ongoing reform initiatives. We go on to address the tough issue of policy alignment. Finally, we raise the issue of affecting local practice.

Implementation in a Changing Political Context

The State Curriculum Frameworks Projects are situated in complex and shifting state political environments. Their long-run strategy to influence the system of mathematics and science education must fit into this context. Up to this point, we have found that, in general, the 16 projects have enjoyed the support of state leadership and state education department officials. State department personnel have viewed the frameworks as a good opportunity to support and enhance existing state activities with federal funds. Acceptance of these projects within state bureaucracies is understandable, given the fact that almost all of them are run by the state department. (New Jersey and the District of Columbia are exceptions.) Yet there is variation across states in the degree to which we can expect support for standards-based reform efforts to continue.

In Wisconsin, for example, there has been a recent history of strong support for a fundamental rethinking of traditional approaches to schooling. One manifestation has been a push for a more integrated curriculum. This philosophy is completely consistent with the integrated curriculum design tool being developed by the state's framework project. Yet the importance of this match may be eclipsed by an ideological shift at the top levels of state government calling for a major reduction in the role the state department (and large cuts in staff). Although the framework project is insulated from direct state cuts, the philosophical shift away from support for a state leadership role could profoundly change the state context within which the final product is implemented.

Such evolving political contexts are unavoidable—change is a permanent part of our political process. Michigan provides another example of how such changes can affect framework projects. The state has had a core curriculum mandate, and the framework project, which promised to provide concrete guidance on how to meet that mandate, initially enjoyed high and positive visibility. With the 1994 election, however, this mandate may be reversed by the Republican-controlled state board and state legislature in favor of local curriculum development. Again, it is hard to predict the direct effects on the frameworks, but it is striking that the education policy playing field has changed so dramatically in such a short time. Two years ago, when the state curriculum mandates were enacted, the legislature viewed them as a means for increased state influence; now state influence is under fire, and the projects themselves may lose political support.

Both Wisconsin and Michigan, in fact, are examples of a general trend across all the states toward more emphasis on local control of education. Across the framework projects, also, some tension is developing regarding the production of state-level standards in a political era that undeniably promotes localizing. Oregon, of course, is one state that dealt with this issue early because of its own political culture. Here, the framework project involves the development of frameworks in 14 local districts, whose products will be distributed statewide on CD-ROM. Although this approach raises questions of quality, it does directly address the tension between state and local control.

Elsewhere, however, political context changes are less dramatic or less likely to affect the frameworks. In nonpartisan Nebraska, the success or failure of most state reforms depends on the degree to which teachers are involved in designing and implementing them. Changes at the state level are not apt to change the necessity for local buy-in. The framework project recognized this fact at the outset, installed a classroom teacher on assignment with the state department as the frameworks director, and assembled a team of teachers to write the actual frameworks.

Implementing Frameworks in the Context of Ongoing Reform Initiatives

The influence of the framework projects on the education system will occur in combination with the many other reforms under way in any one state. Fortunately, most of the framework projects were originally devised as parts of broader reform efforts. For example, in Delaware, the framework project was conceived as part of the New Directions initiative, in New York as part of the New Compact for Learning and in Arkansas as part of the Math and Science Crusades. In almost all the states (New Jersey is the possible exception), the framework project began as a relatively well-integrated effort within a larger state reform agenda.

How well the framework projects fit with other improvement efforts can change with time, as new reforms begin and older efforts evolve to fit the dynamic political context. (For a glimpse of how complex the reform landscape is in some of these states, see Exhibit 6.) For example, in New York, the project's tight integration into the New Compact could potentially become a liability because the new governor opposes centralized initiatives.

Massachusetts provides another interesting example of the way integration within broader reform initiatives influences the evolution of the framework projects. Here, the

project has developed particularly well-received curriculum frameworks in mathematics and science. State officials realized that the mathematics and science frameworks were ahead of the other disciplines, that the development processes varied widely across disciplines, that broad agreement on generic issues was needed, and that an encyclopedic collection of frameworks would be unusable. As a result, the approval of the mathematics and science frameworks was postponed as the state grappled with these difficult issues. In the end, the influence of the mathematics and science frameworks on policies and practice in those subject areas has been slowed, whereas their influence on the development of frameworks in other disciplines has increased.

Exhibit 6

MAJOR STATE AND FEDERAL REFORM INITIATIVES UNDER WAY

State Curriculum Frameworks Projects	NSF's SSI	NSF's USI	NSF's Teacher Collab.	ED's Goals 2000	ED's Fund for Innovation	State Initiative
Alaska				✓	✓	Alaska 2000
Arizona		Phoenix		✓	✓	Journey Schools
Arkansas	✓			✓	✓	Act 236
Delaware	✓			✓	✓	New Directions
District of Columbia		WDC		✓	✓	
Florida	✓	Dade		✓		Blueprint 2000
Louisiana	✓		✓	✓		None
Maine	✓			✓		LD 1189
Massachusetts	✓		✓	✓		Education Reform Act
Michigan	✓	Detroit		✓	✓	Public Act 335
Nebraska	✓			✓	✓	Nebraska 2000
New Jersey	✓			✓		Strategic Plan
New York	✓	NYC		✓		New Compact
Oregon				✓		Oregon Education Act
Rhode Island				✓		None
Wisconsin				✓	✓	Wisconsin Act 269

The Special Case of NSF's Statewide Systemic Initiatives

Ten of the 16 State Curriculum Frameworks Projects are located in states that are also engaged in Statewide Systemic Initiatives (SSI) funded by the National Science Foundation. The initiatives are 5-year efforts to use a variety of systemic reform strategies to improve mathematics and science education in the state. Because the framework projects and the SSIs share the same general goal of standards-based reform and focus on the same content areas, we are particularly interested in how well the projects are connected with the SSIs, and what effect the entire SSI program has had on each state with a framework project. In general, we found close links between the projects and the SSIs in the 10 states. In nearly every state, we found regular communication and cooperation between the SSI and the project. In some states, the combination of the two initiatives established new lines of communication, usually in the form of a formal coordinating committee. In some states, like Maine and Massachusetts, we found overlapping leadership in the two programs. These linkages were often enhanced when the two projects were located in smaller state departments of education or, in the unique case of New Jersey, at Rutgers University.

More surprisingly, the SSI program seemed to have an effect on the State Curriculum Frameworks Projects even in states that did not have an SSI. According to our informants, the process of preparing an SSI application, particularly for those states that applied more than once, forced often disparate mathematics and science leaders in the state to meet and form agreements about the direction of the reform effort. Of the six curriculum framework project states without SSIs, five applied for an SSI award at least twice. Wisconsin was the exception, applying only once. Thus, even if the SSI proposal was not accepted, the preparation of the proposal established coalitions and a strategy that made the development of a strong proposal for the State Curriculum Frameworks Projects grant possible.

Linkages to the Regional Consortia and Eisenhower State Grant Program

The ED solicitation for Regional Consortia specifically charged applicants to "provide technical assistance to help States adopt world class standards in mathematics and science, develop curriculum frameworks that embody these standards, and develop new forms of assessment matched to the curriculum frameworks." Regional Consortia took this charge seriously and have attempted to play a significant role in states' efforts at framework development (see Haslam, Colopy, and Turnbull, 1995).

The Regional Consortia have been important contributors to framework development in a number of states with Eisenhower State Curriculum Frameworks Projects. For example, the Consortia have played significant support roles in the District of Columbia, Oregon, and Alaska. The Consortia's support has also been helpful in other project states, including New Jersey, Arizona, and New York.

Importantly, the Consortia have been able to play crucial roles in states that did not enjoy the resources that accompanied federal grants. For example, the Far West Regional Consortium worked hard to facilitate the development of science frameworks in Utah. There, the director of the Consortium played a pivotal role in bringing the disparate science community together to establish a state vision for science education. Respondents in South Dakota, another state without a framework project, volunteered similar information about the usefulness of resources provided by High Plains Consortium.

The High Plains Consortium has aided state curriculum frameworks throughout the country by disseminating its "Curriculum Frameworks Analysis Tool" and "Frameworks Summary" documents. These products have recently been used in a teaming arrangement between the High Plains Consortium and the Regional Alliance to assist states in implementing frameworks and to assess state progress on these projects. This partnership is organizing and conducting case studies of framework development in a sample of states nationwide.

In the majority of framework states, however, the Consortia have played less significant roles or no role at all. For example, in a number of states, Consortia staff are contracted to evaluate the framework project but have no direct role in framework development. This lack of strong relationship between the Consortia and some of the framework projects should not be interpreted as necessarily negative. The framework states were awarded grants previously because they evidenced the ability to put together a framework. From this perspective, the use of Regional Consortia resources to support states without frameworks projects is reasonable.

Linkages between the frameworks projects and the Eisenhower State Grant Program are only beginning to emerge. State Eisenhower coordinators typically participate in or advise framework projects, and most coordinators expected the curriculum frameworks to help guide decisions about how Eisenhower State Grants would be managed. However, we are not yet clear how these linkages will be operationalized. Some states have formed groups to try to better coordinate the whole range of mathematics and science education

initiative. In New York, the mathematics and science steering committee meets regularly and includes the SSI coordinator, the Eisenhower State Grant Program coordinator, the State Curriculum Framework Project director, and other key mathematics and science leaders in the state education department. Such formal linkages are not in place in other states. As frameworks documents and other products are completed, we will more closely examine the linkages between the frameworks projects and the Eisenhower State Grant Program.

The Difficult Task of Aligning Education Policies

One of the first arenas in which projects can hope to exert an influence is state education policy. Indeed, the framework projects set out to influence directly policies and practices related to teacher education, recertification, and professional development—and they have made some progress in these areas. Massachusetts has recently adopted a policy that requires teachers to be recertified every 5 years on the basis of completing continuing professional development. New York is currently piloting new assessments in various schools across the state. Nebraska is investing in its technology infrastructure in ways that move the state closer to the vision for technology expressed in its framework. Arkansas' Math and Science Crusades are giving professional development opportunities to teachers that are in line with key elements of its frameworks. Indeed, most states can cite examples of policy changes that reflect the spirit and vision of the frameworks.

At the same time, other attempts to align education policies with the frameworks often require financial resources that are hard to come by in resource-scarce states. For example, in New Jersey, plans for a new assessment system were postponed because of the high cost of development. In New York, continuing funds for the support of the School Quality-Review are in question. In Oregon, the state's largest district had to suspend all professional development activities because of a budget shortfall. In Arizona, the legislature reduced the number of units required for a teaching credential because of concern over the costs of its higher education.

Perhaps the most difficult policy to bring into alignment is assessment. As of spring 1994, only 2 (Maine and Massachusetts) of the 10 states with both Eisenhower State Curriculum Frameworks Projects and SSIs reported having state assessments aligned with the goals of its SSIs in both mathematics and science—and presumably with the similar goals of their framework projects (LaGuarda et al., 1994). The reasons for this disjuncture are many: developing new assessments is technically difficult, costly (as the

aforementioned case of New Jersey attests), and politically charged—especially when assessment is to be used for accountability purposes.

Rhode Island is a case in point. The state has expressed a strong commitment to new assessments in line with the goals of its frameworks. Yet, when a new test was piloted, it ran into numerous problems. Local educators, disappointed in part by the low scores, derided the usefulness of the test. Then, in the face of budgetary pressures, further development was halted.

Moreover, the accountability aspect of state testing systems can be at odds with many frameworks' focus on the use of assessment for instructional improvement within the classroom. Some critics have expressed reservations about standards-based reform, fearing that despite the sponsors' intention to have the standards be statements of aspiration, they will be turned into measurement devices. If that were to happen, frameworks could become instruments that support the culture of sorting and testing instead of guides that promote equity and higher achievement (Lagemann, 1995).

The draft framework documents from the projects appear to recognize the inherent tension between aspiration and measurement and attempt to address it in their discussions of assessment. For example, the Alaska framework acknowledged the multiple purposes of assessment: instructional improvement, public accountability, and informing local policy decisions. Although the framework offers no prescription for dealing with the multiple and competing purposes of assessment, it does suggest that teachers keep good records of students' performance in authentic assessment, "especially if the documentation contradicts the performance on standardized tests."

Other documents argue against using the framework and assessments derived from it for anything other than instructional improvement. According to the Massachusetts framework, "Assessment should be used as a tool to improve instruction and enhance student learning." The framework stresses the constructive rather than the punitive nature of good assessments and the importance of careful links to curriculum and instruction.

As these examples suggest, aligning education policies—especially assessment systems—with curriculum frameworks is likely to be a slow process. Yet, given the need to build broad public support if improvements in public education are to be sustained, the debates over policy changes cannot be fast-tracked. States have found that the process of building a consensus over what students should know and be able to do in mathematics

and science is a complex and largely unfinished task. There is no reason to expect that the process of reaching agreement over how to allocate resources, assess progress, and prepare and support teachers will be any less daunting.

Unanticipated Use of the Frameworks

Framework developers also have to be aware of the many uses of such documents, beyond those intended by the authors. We have already noted a fear of some critics that standards contained in frameworks will be used to track students in punitive ways. Beyond this potential misuse, standards and frameworks may also be used for purposes unimagined by their authors. For example, New Jersey's recently developed *Comprehensive Plan for Educational Improvement and Financing: An Interim Report* calls for standards to be used to define the state's fiscal responsibility under its constitutional obligation to provide for "a thorough and efficient education." The authors of New Jersey's mathematics standards and mathematics framework never envisioned that their work would be in the middle of the state's long-standing school finance battles. As we follow the implementation of the frameworks over the next few years, we will need to pay careful attention to both the policy and instructional purposes of curriculum frameworks.

Facing the Challenge of Improving Teaching and Learning

Despite the many accomplishments of the framework projects, their efforts will have been wasted if they do not result in improved teaching and learning. Naturally, the framework projects were not designed to affect practice directly, yet they were seen as an important first step in doing so. The challenge facing the states with framework projects, if not the projects themselves, will be to use the frameworks and other products developed to support a broad and coherent strategy that can lead to changes at the school and classroom levels. Critics of standards-based reform argue that such strategies are typically missing:

> The legislation [Goals 2000] relies upon the elaborate machinery of governmental bureaucracies to operate as a catalyst for school reform. The federal government will tell state governments that they need to do better, local districts will tell school principals that they need to do better, and principals will tell teachers that they need to do better—trickle-down reform. (Loveless, 1994)

At this point in the study, we are not able to judge the degree to which such criticisms are relevant to the framework projects. As we continue to study the projects through on-site fieldwork, we will explore their strategies for changing local practice. In doing so, we are mindful of the difficulties they face in changing the many forces that influence what goes on in classrooms across a crowded landscape of reform initiatives.

Making significant improvements in teaching and learning requires changes in teachers (their knowledge, skills, and beliefs), in the resources available to those teachers (equipment, technology, lab space, instructional materials), in the school organization (climate and norms, the organization of space and time, leadership), and in community support of the schools (Zucker and Shields, 1995). This is quite a tall order, one that is clearly beyond the framework projects themselves—and none of the projects has proposed or intended to address all these factors. But the state efforts to use the frameworks to influence the system must include strategies to address these issues.

Whatever strategies the states do devise will have to contend with the fact that, after a decade of sustained attention to the problems of education, schools have become very cluttered with reform programs and projects. We saw an example of the clutter of reform in one school, which boasted of its membership in the Coalition of Essential Schools and the New Standards Project, its participation in the SSI, and its faculty's involvement in another national reform initiative. In many schools, particularly in urban settings, this clutter is compounded by a litany of social problems: poverty, violence, teen pregnancy, drugs, and homelessness. Within this context, the influence of a state-developed document can be minimal. As one framework project director noted:

> "Because states and districts are trying to do a systemic kind of change, many things have to change simultaneously. People feel overwhelmed with activities and initiatives. They don't see how all the pieces fit together. That's the challenge that is facing all of us. [Teachers think] this is just one more thing."

Other directors point to the difficulty of building public interest and support for the vision expressed in the framework. As an informant in Maine lamented: "The biggest thing in the newspaper up here is the OJ trial. I can't get them to cover the math and science frameworks."

Given these challenges, many well-intentioned reform efforts result in very uneven changes at the classroom level as some teachers are affected while others are not; some

teachers change very little while others make great strides (Cohen, 1990; Peterson, 1990; Zucker, Shields, Adelman, and Powell, 1995). The continuing challenge for reformers is to understand "the actual avenues of influence—that is, the transactions at the local level and elsewhere through which teachers were either prodded or inspired to find ways to make teaching for understanding part of their repertoires, and supported over time in their efforts to do so" (Knapp, 1995). The challenge for evaluators is also to identify those avenues and then to assess states' progress in using them to influence the process of teaching and learning within classrooms.

VI CONCLUDING OBSERVATIONS ON THE STATE CURRICULUM FRAMEWORKS PROJECTS

The State Curriculum Frameworks Projects undertook an ambitious reform agenda: to develop curriculum frameworks (usually in both mathematics and science for K-12), designing new preservice education and certification model guidelines, developing criteria for teacher recertification, and devising and piloting new approaches to inservice professional development. Moreover, states took on these challenges in the context of an array of other educational reform efforts already under way.

Overall, we have found that states are making good progress in drafting and revising the framework documents. In fact, drafts have been completed on 22 of the 28 frameworks proposed across the 16 states. In the process of drafting these documents, the projects have involved thousands of teachers, other professionals, and the public in discussions about what students should know and be able to do in mathematics and science. These discussions have raised a series of issues that most framework projects have had to address, including the relationship between these new documents with their focus on higher-order skills and older, more basic-skills-oriented state directives; integrated approaches to curriculum; and the role of technology.

Progress in the development of other products, such as model certification guidelines, and in the initiation of other activities, such as piloting model professional development activities, has been much more uneven across the states. In part, this situation simply reflects the fact that states are waiting to get solid framework drafts out before they begin work on these other project components. In part, the unevenness can be traced to variation in the degree to which states perceive these other products to be central to their work. Also, some of these components are simply harder to do, especially those like certification and recertification requirements, which raise a series of political issues that framework projects alone are not well positioned to deal with.

Regardless of how much progress states have made in developing frameworks and other products or in launching new activities, we are left with two central questions: (1) Are the products of high quality? (2) Are they having any impact on the system of mathematics and science education? We only begin to address these questions in this first interim report. In terms of quality, we report the preliminary findings of a group of experts funded jointly by this study and one carried out by the Council of Chief State School Officers (CCSSO, 1995). The experts did not make independent judgments of the

quality of specific frameworks but did point to a number of findings looking across many frameworks, including the lack of adherence to national standards that becomes evident once one focuses on the detailed recommendations and examples in the documents. This finding is particularly important because it illustrates the difficulty inherent in putting together a fully coherent document and the high stakes associated with using the national standards (NCTM in mathematics and AAAS and NAS in science) as the basis for assessing the quality of frameworks across all states. Indeed, some state officials consider use of the national standards inappropriate. These are issues we will return to as we bring the experts together in school year 1995-96 to look at another set of documents.

We have also just begun in this report to address the issue of the projects' influence on the education system. Changing state systems is beyond the resources of the framework projects themselves, and it is too early to expect much of an effect from these projects anyway. Still, the development of the frameworks and other products and activities was initially designed as a starting point for broader, standards-based reforms in the states. A major task of our work in subsequent years of this evaluation will be to assess the impact of the frameworks and other products beyond those involved in the development and piloting processes.

In this year's report, we have raised a number of issues that states will have to address as they seek to implement their frameworks and other products—that is, as they work to improve the system of schooling. These issues include the challenges state reformers face in working in an ever-changing political environment. In particular, the broad movement toward more local control of schooling raises issues for state-driven reform efforts. Second, project staff will be trying to "roll out" their frameworks and other products in the context of a variety of ongoing reform efforts. This problem is especially critical to address at the local level, where teachers and administrators can easily become overwhelmed by the demands being made on them and so become cynical of this effort as just another fad that, too, shall pass. Third, states face a difficult task in changing educational policies, especially those that require political, technical, and financial capital. Examples of such policies include some for which the projects bear some direct responsibility, like teacher preparation or certification, and others that are important to standards-based reform but that the projects have not proposed to address directly, like assessment.

Finally, we address the issue of improving the process of teaching and learning—the ultimate purpose of both the U.S. Department of Education and all the framework

projects. We argue against a simple linear expectation that products will be developed one day and improve practice the next. Rather, we underscore the importance of states devising strategies (and evaluators tracking those strategies) that work to affect some of the many avenues of influence that ultimately determine what teachers choose to do in the classroom. Framework projects, like any reform effort, cannot do it all. So, state reformers, as they build on what the framework projects have accomplished, have to seek judicious ways to influence the system. Possible avenues of influence include ensuring the availability of instructional materials consistent with the philosophy of the frameworks, supporting appropriate professional development for teachers, building public support for the frameworks' goals, and redesigning accountability and incentive systems to support teaching and learning in line with the frameworks.

In taking on these challenges, reformers need to strike an appropriate balance between the development or adoption of products to be used by educators throughout the system and the creation of opportunities for educators and the public to engage in the tough task of redesigning the educational system for themselves. Project staff addressed this challenge in the development of the initial drafts of the framework documents, balancing the need for the creation of a high-quality document in a limited amount of time with the desire to engage teachers and the public in a meaningful discourse about what students should learn. The same balance will need to be struck in dealing with any other reforms in the system, whether they be improving undergraduate teacher education, designing new professional development, or aligning other policies or practices with reform goals.

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